Dual P-Channel Enhancement Mode Power MOSFET

MTDP9933KQ8

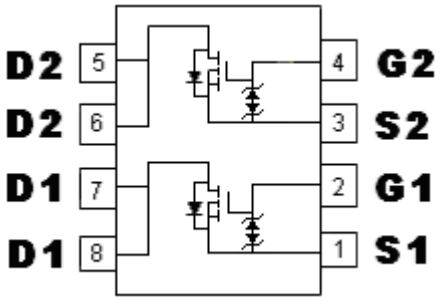
BV_{DSS}	-20V
I_D@V_{GS}=-4.5V, T_A=25°C	-4.5A
I_D@V_{GS}=-4.5V, T_C=25°C	-7.5A
R_{DSON}@V_{GS}=-4.5V, I_D=-4A	28 mΩ(typ)
R_{DSON}@V_{GS}=-2.5V, I_D=-4A	36 mΩ(typ)
R_{DSON}@V_{GS}=-1.8V, I_D=-2A	44 mΩ(typ)

Features

- Simple drive requirement
- Low on-resistance
- Fast switching speed
- Pb-free lead plating and halogen-free package
- ESD protected device

Equivalent Circuit

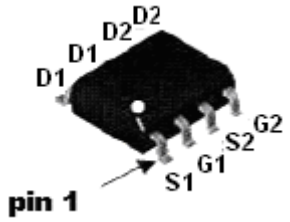
MTDP9933KQ8



G：Gate
S：Source
D：Drain

Outline

SOP-8



Ordering Information

Device	Package	Shipping
MTDP9933KQ8-0-T3-G	SOP-8 (Pb-free lead plating and halogen-free package)	2500 pcs / tape & reel

Environment friendly grade : S for RoHS compliant products, G for RoHS compliant and green compound products

Packing spec, T3 : 2500 pcs / tape & reel, 13” reel

Product rank, zero for no rank products

Product name

Absolute Maximum Ratings (Ta=25°C)

Parameter		Symbol	10s	Steady State	Unit
Drain-Source Voltage		V_{DS}	-20		V
Gate-Source Voltage		V_{GS}	±8		
Continuous Drain Current @ T_C=25°C, V_{GS}=-4.5V (Note1)		I_D	-7.5		A
Continuous Drain Current @ T_C=100°C, V_{GS}=-4.5V (Note1)			-4.7		
Continuous Drain Current @ T_A=25°C, V_{GS}=-4.5V (Note2)		I_{DSM}	-6.0	-4.5	
Continuous Drain Current @ T_A=70°C, V_{GS}=-4.5V (Note2)			-4.8	-3.6	
Pulsed Drain Current (Note3)		I_{DM}	-40 *1,2		
Total Power Dissipation	T_C=25℃ (Note1)	P_D	3.1		W
	T_C=100℃ (Note1)		1.2		
	T_A=25°C (Note2)	P_{DSM}	2.0	1.1	
	T_A=70°C (Note2)		1.3	0.7	
Operating Junction and Storage Temperature Range		Tj, Tstg	-55~+150		°C

Thermal Data

Parameter		Symbol	Typical	Maximum	Unit
Thermal Resistance, Junction-to-case		$R_{th,j-c}$	34	40	°C/W
Thermal Resistance, Junction-to-ambient (Note2)	t≤10s	$R_{th,j-a}$	58	62.5	
	Steady State		91	110	

Note : 1. The power dissipation P_D is based on $T_{J(MAX)}$=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

2. The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2 oz. copper, in a still air environment with T_A=25°C. The power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.

3. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and low duty cycles to keep initial T_J=25°C.

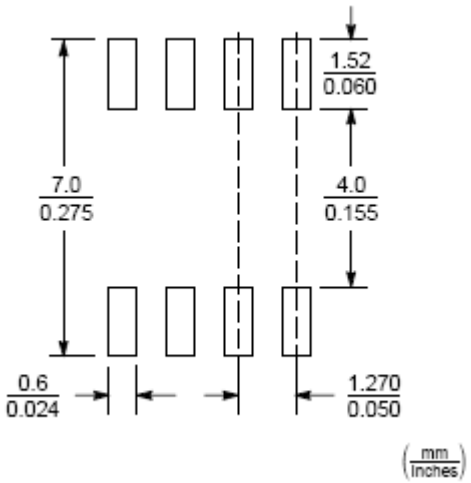
Electrical Characteristics (Tc=25°C, unless otherwise noted)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	-20	-	-	V	V_{GS}=0V, I_D=-250μA
$V_{GS(th)}$	-0.3	-	-0.9		V_{DS}=V_{GS}, I_D=-250μA
I_{GSS}	-	-	±10	μA	V_{GS}=±8V, V_{DS}=0V
I_{DSS}	-	-	-1		V_{DS}=-20V, V_{GS}=0V
I_{DSS}	-	-	-5		V_{DS}=-20V, V_{GS}=0, Tj=55°C
$R_{DS(ON)}$ (Note 1)	-	28	38	mΩ	I_D=-4A, V_{GS}=-4.5V
	-	36	48		I_D=-4A, V_{GS}=-2.5V
	-	44	62		I_D=-2A, V_{GS}=-1.8V
G_{FS} (Note 1)	-	30	-	S	V_{DS}=-5V, I_D=-3A

Dynamic					
Ciss	-	828	1242	pF	V_{DS}=-10V, V_{GS}=0, f=1MHz
Coss	-	134	201		
Crss	-	127	191		
$t_{d(ON)}$ (Note 1&2)	-	4.2	6.3	ns	V_{DS}=-5V, I_D=-0.5A, V_{GS}=-4.5V, R_G=6Ω
t_r (Note 1&2)	-	23.6	35.4		
$t_{d(OFF)}$ (Note 1&2)	-	54.6	81.9		
t_f (Note 1&2)	-	28.8	43.2		
Qg (Note 1&2)	-	10.6	15.9	nC	V_{DS}=-10V, I_D=-3.8A, V_{GS}=-4.5V
Qgs (Note 1&2)	-	1.2	-		
Qgd (Note 1&2)	-	3.9	-		
Rg	-	5.8	-	Ω	f=1MHz
Source-Drain Diode					
I_S	-	-	-1.7	A	
I_{SM}(Note 3)	-	-	-10		
V_{SD}(Note 1)	-	-0.76	-1	V	I_S=-1A, V_{GS}=0V
trr	-	22.3	-	ns	I_F=-1.3A, dI_F/dt=100A/μs
Qrr	-	4.4	-	nC	

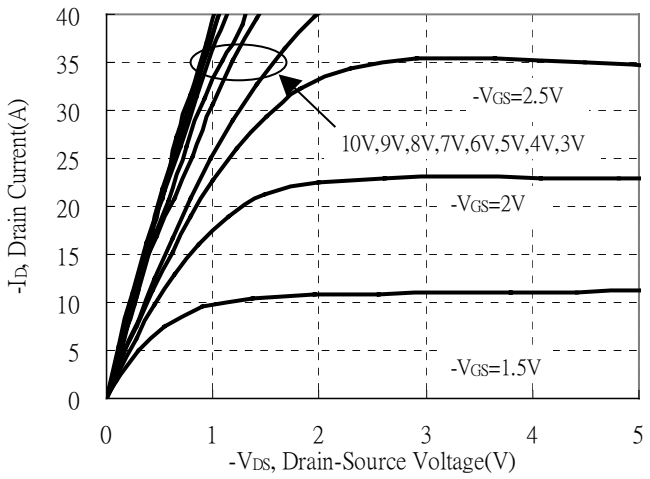
Note : 1.Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%
2.Independent of operating temperature
3.Pulse width limited by maximum junction temperature

Recommended Soldering Footprint

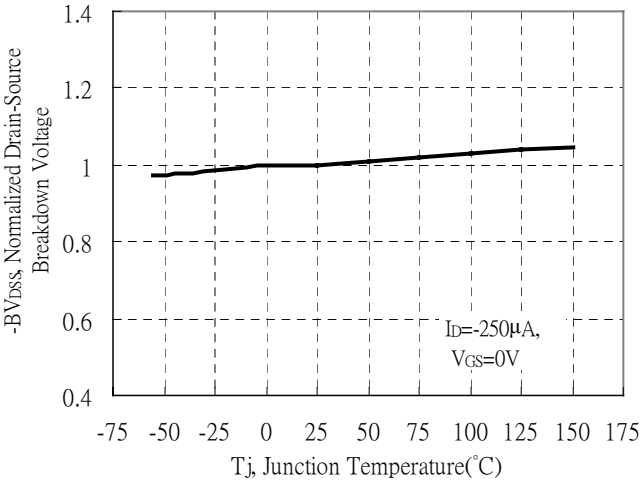


Typical Characteristics

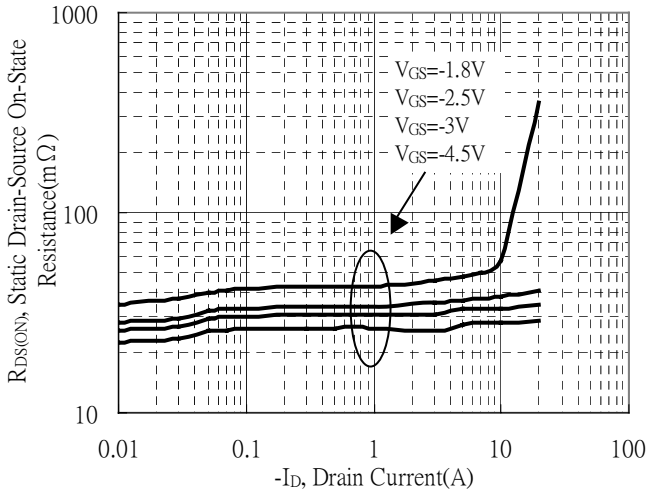
Typical Output Characteristics



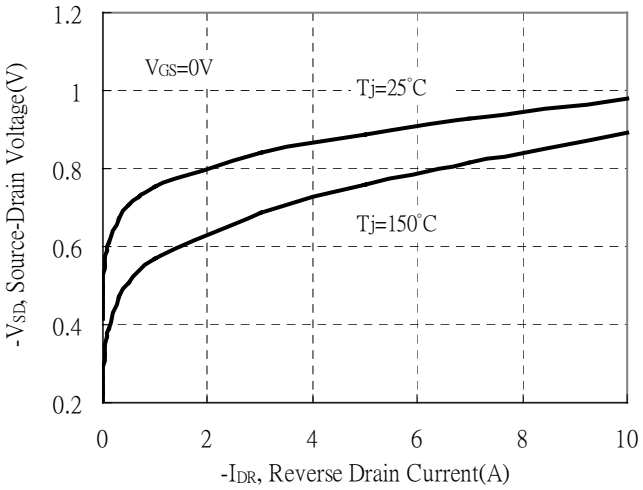
Brekdown Voltage vs Ambient Temperature



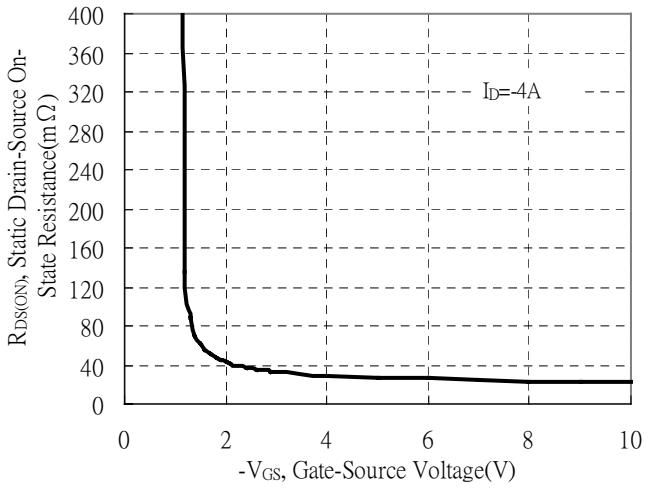
Static Drain-Source On-State resistance vs Drain Current



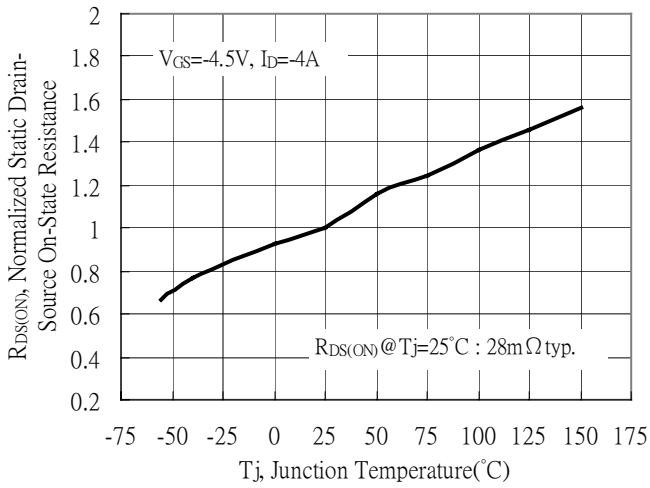
Reverse Drain Current vs Source-Drain Voltage



Static Drain-Source On-State Resistance vs Gate-Source Voltage

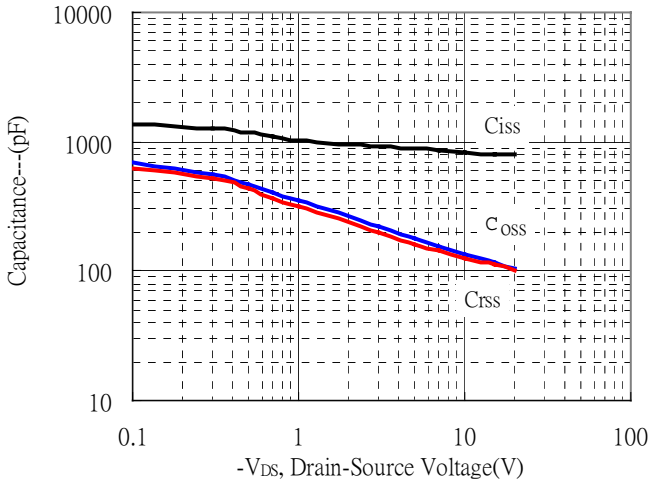


Drain-Source On-State Resistance vs Junction Tempearture

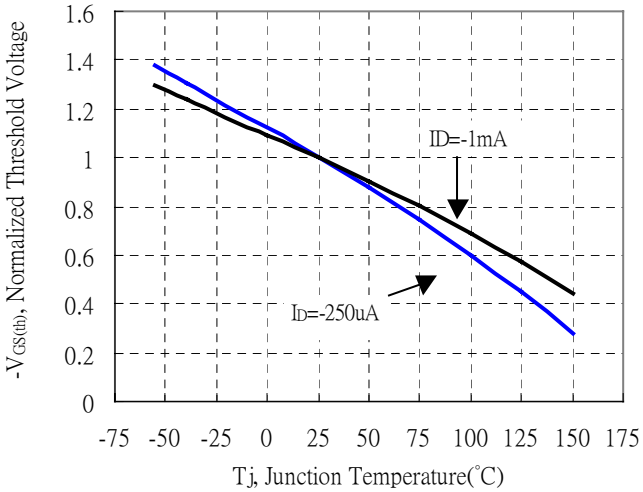


Typical Characteristics(Cont.)

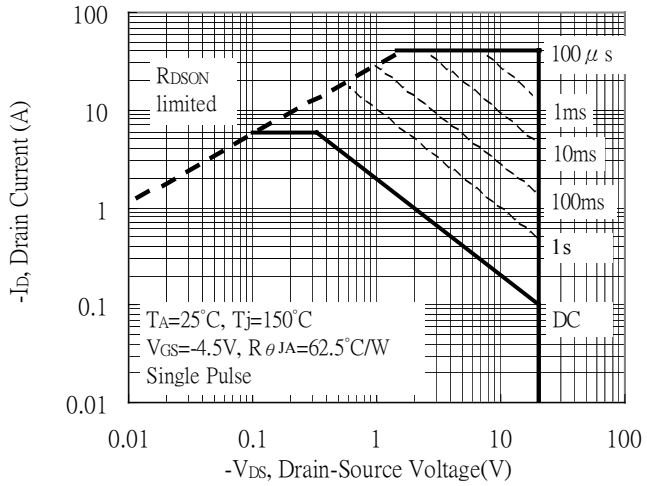
Capacitance vs Drain-to-Source Voltage



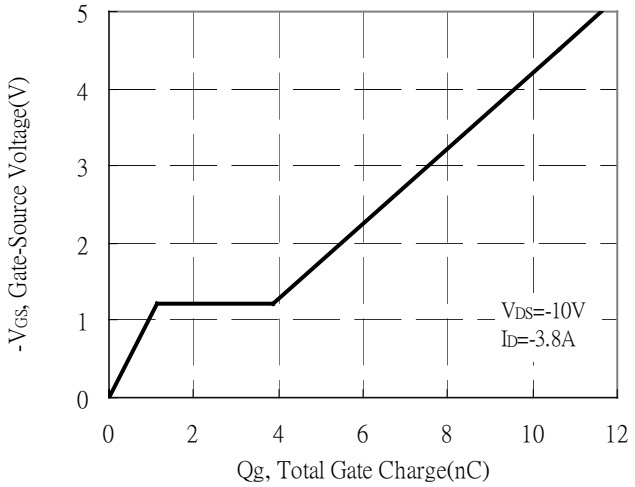
Threshold Voltage vs Junction Tempearture



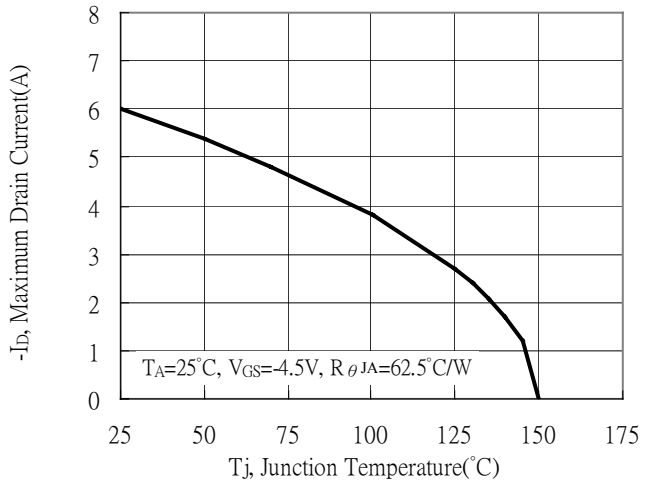
Maximum Safe Operating Area



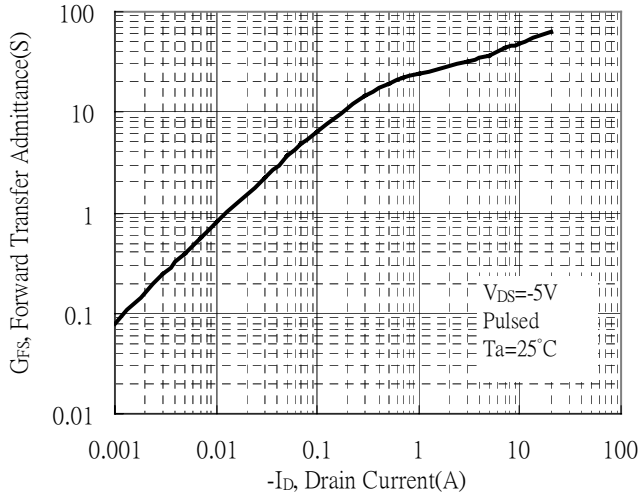
Gate Charge Characteristics



Maximum Drain Current vs Junction Temperature

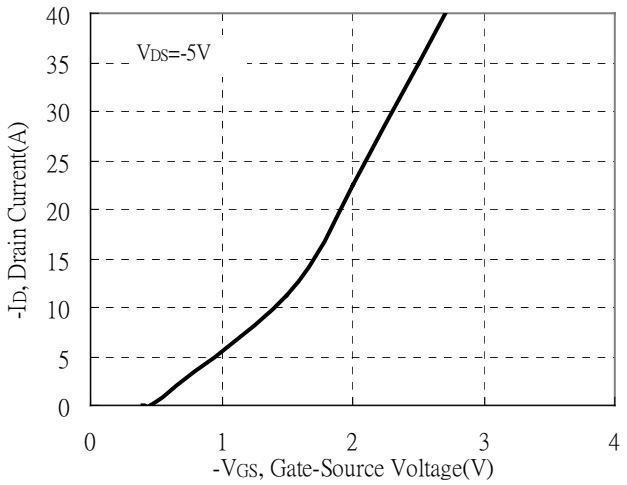


Forward Transfer Admittance vs Drain Current

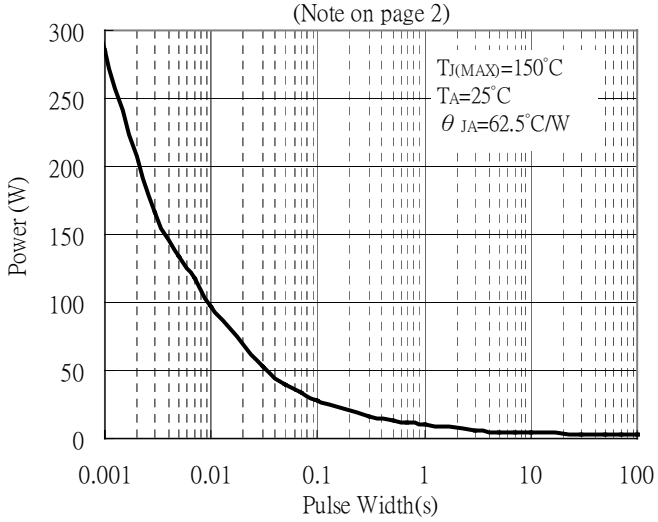


Typical Characteristics(Cont.)

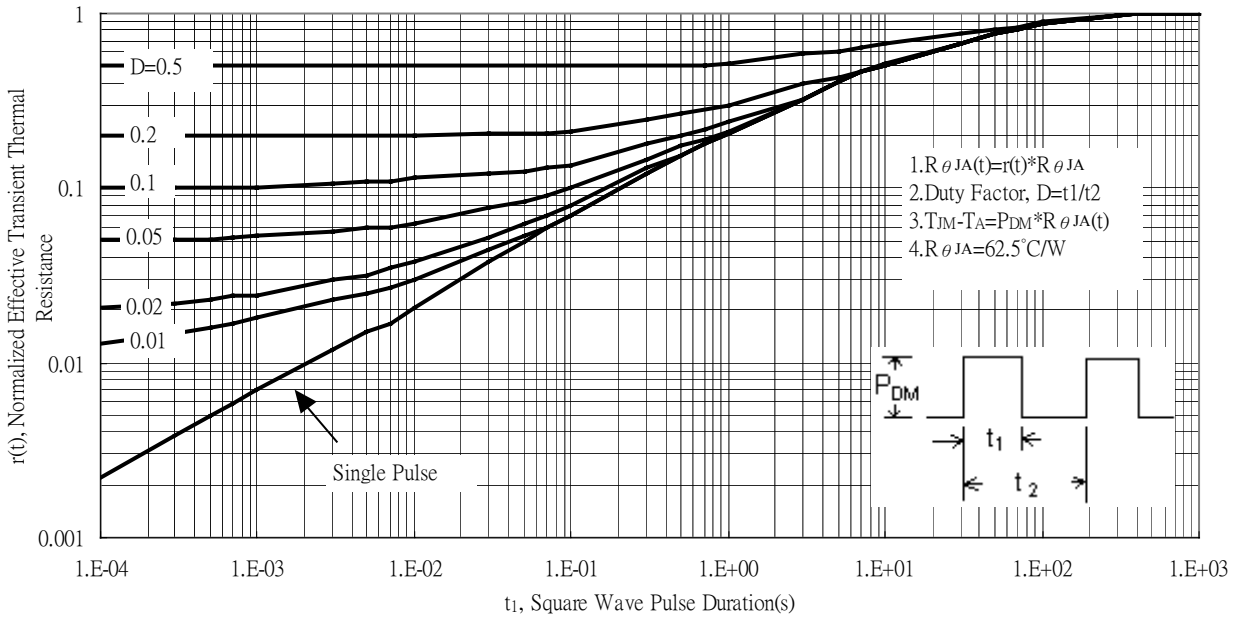
Typical Transfer Characteristics



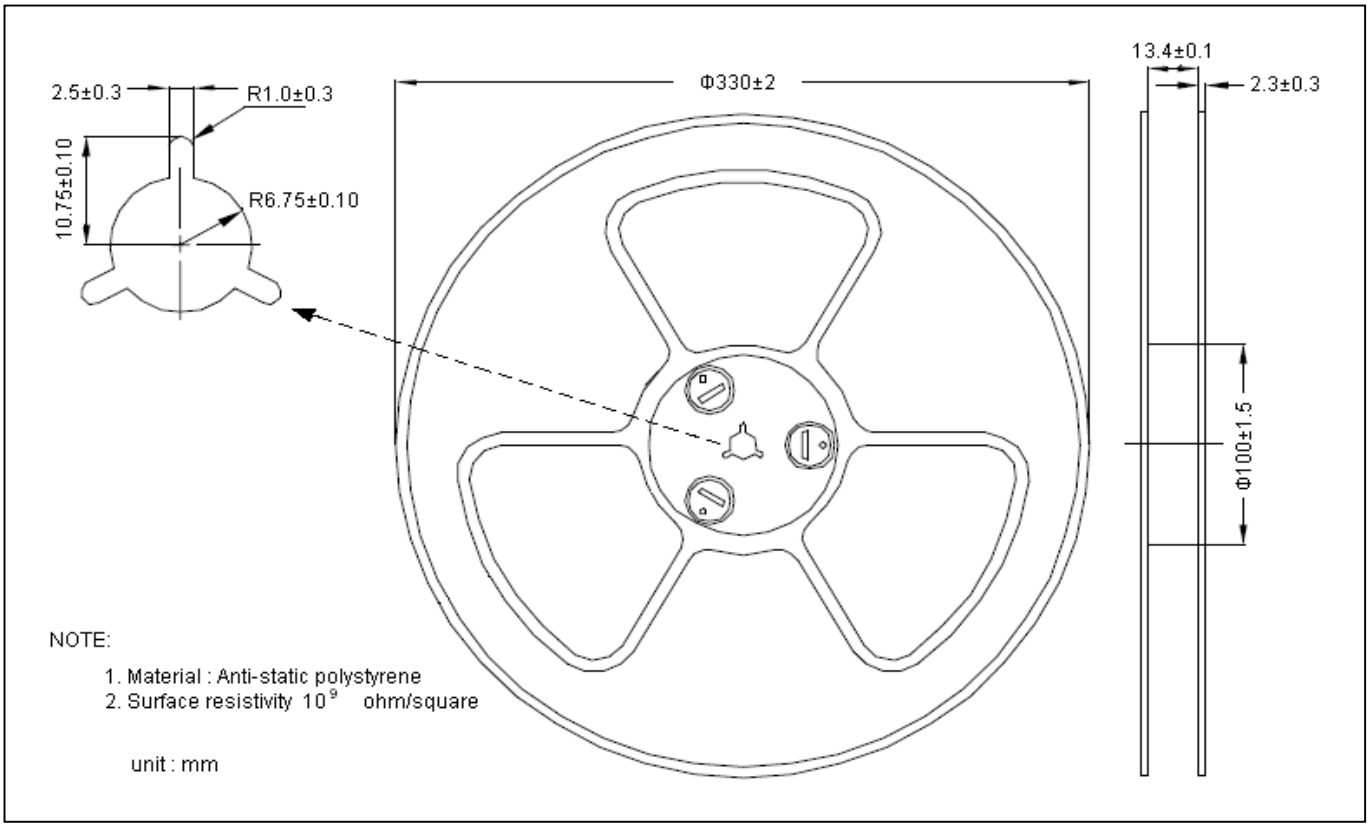
Single Pulse Power Rating, Junction to Ambient
(Note on page 2)



Transient Thermal Response Curves



Reel Dimension

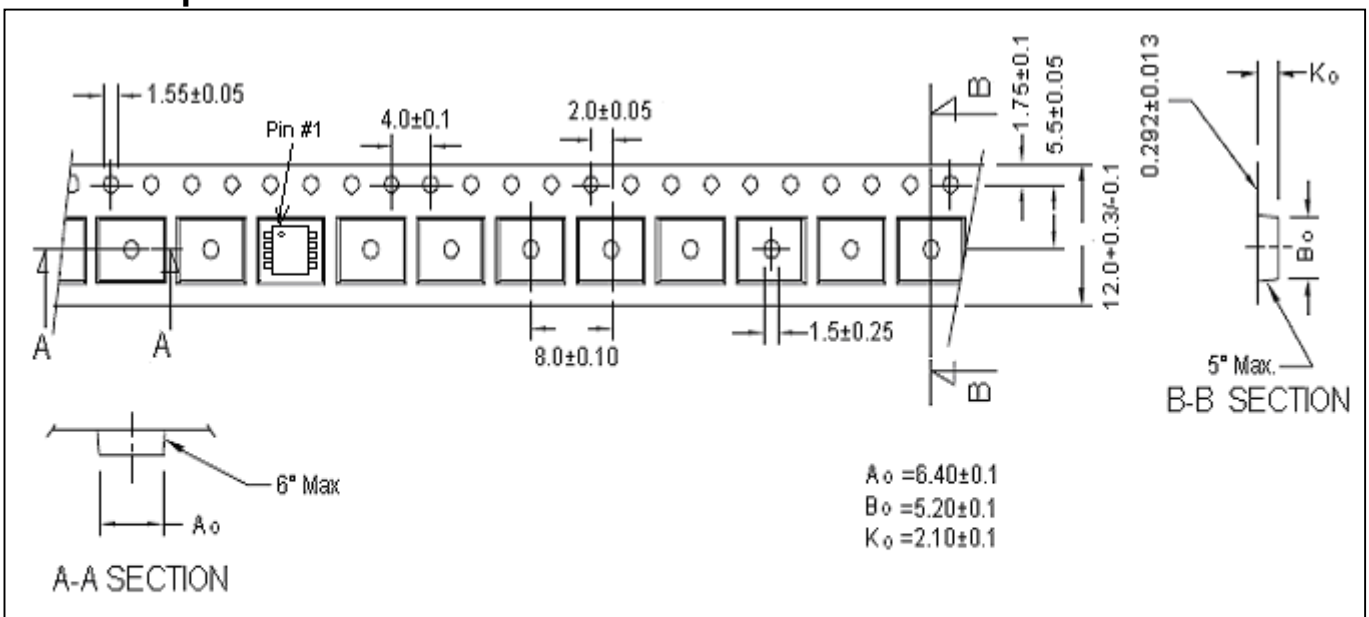


NOTE:

1. Material : Anti-static polystyrene
2. Surface resistivity 10^9 ohm/square

unit : mm

Carrier Tape Dimension



Ao =6.40±0.1
Bo =5.20±0.1
Ko =2.10±0.1

Notes:

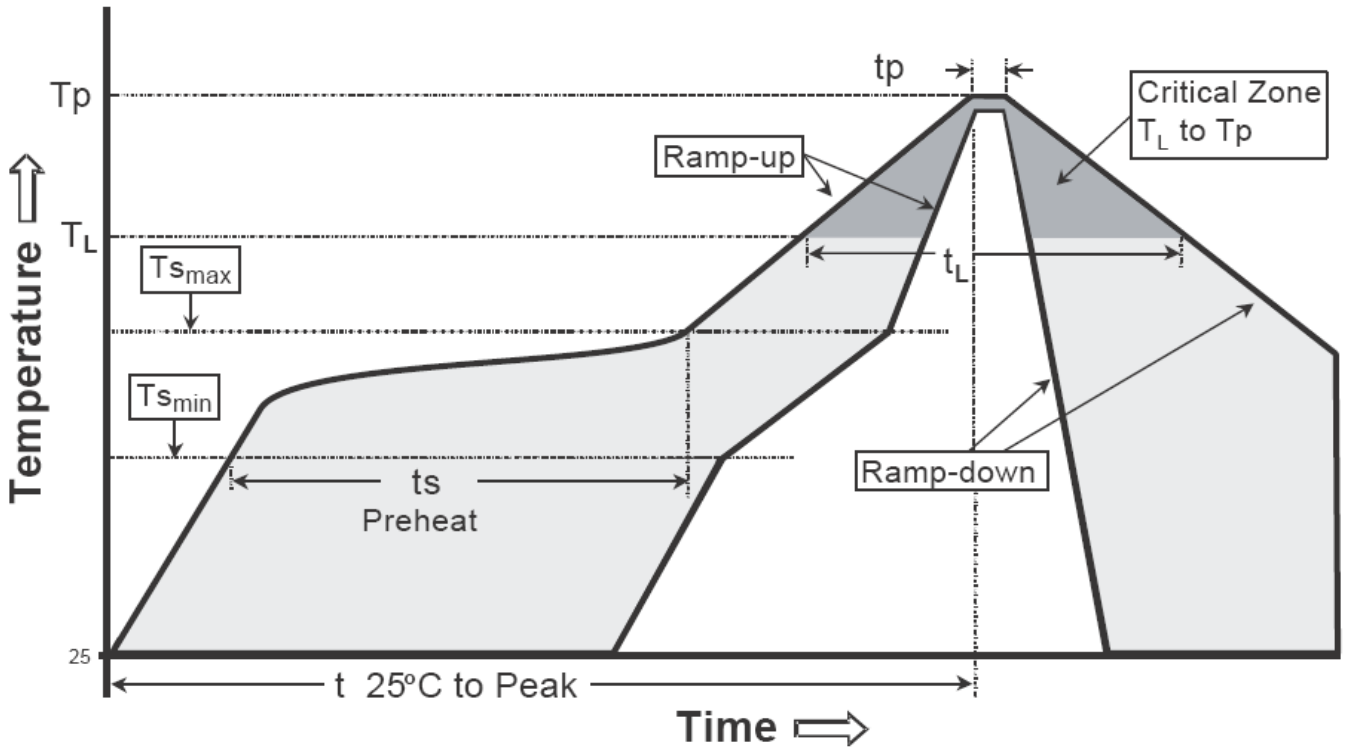
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material: conductive black polystyrene
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

Uni : millimeter

Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

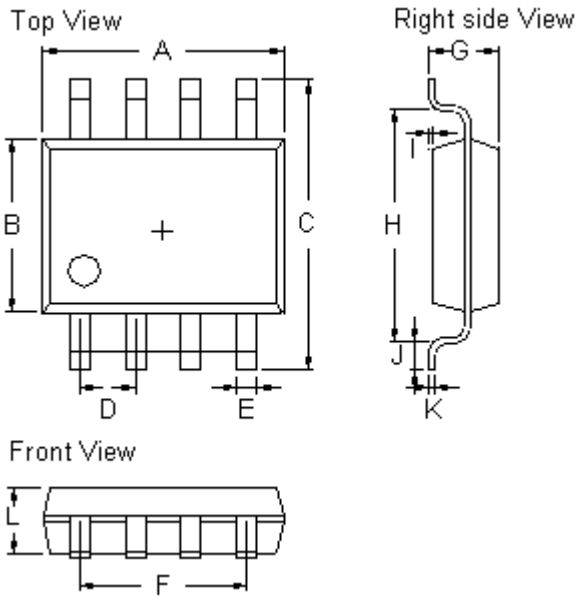
Recommended temperature profile for IR reflow

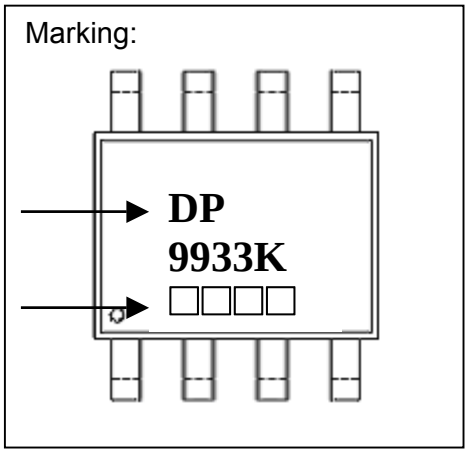


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (T_L) − Time (t_L)	 183°C 60-150 seconds	 217°C 60-150 seconds
Peak Temperature(T_P)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

SOP-8 Dimension





8-Lead SOP-8 Plastic Package
CYStek Package Code: Q8

*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1850	0.2007	4.70	5.10	G	0.0531	0.0689	1.35	1.75
B	0.1496	0.1575	3.80	4.00	H	0.1889	0.2007	4.80	5.10
C	0.2283	0.2441	5.80	6.20	I	0.0019	0.0098	0.05	0.25
D	0.0500*		1.27 *		J	0.0157	0.0500	0.40	1.27
E	0.0130	0.0201	0.33	0.51	K	0.0067	0.0098	0.17	0.25
F	0.1472	0.1527	3.74	3.88	L	0.0531	0.0610	1.35	1.55

Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.